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ABSTRACT

A futurist addresses two questions concerning world peace and the implications of using robots. In the section on peace (part 1), recommendations for world peace include: (1) implementing peace education as a mandatory part of education; (2) establishing a Department of Peace in each country to create a societal infrastructure for implementing peace; (3) institutionalizing a peace-industrial complex stronger than a military-industrial complex in which peace would become a profitable enterprise, (4) establishing a standard peace index for measuring the "quality of peace," (5) studying the meaning of peace in all contexts, (6) building machinery/technology for peace, and (7) conducting research and development for peace. Part 1 concludes that society needs preventive systems which are future-oriented to achieve peace rather than reactive tactical systems. Part 2 focuses on the future of robots, defines artificial intelligence, and makes a distinction between expert systems and robots. The section concludes that while robots and automated machines directly displace people from jobs, expert systems (consulting tools or appliances used for amplifying human skills) will actually create new jobs and raise society's standard of living by making humans increasingly more "intelligent" and capable. (LH)

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ASK A FUTURIST. PEACE [and] ROBOTS

By

EARL C. JOSEPH

Paper presented at the
World Future Society's Fifth Assembly
(Washington, D.C., July, 1984)

ASK A FUTURIST. Peace.

Dear Futurist: **I'm concerned about peace. What do we need at the highest priority level to have peace throughout the world on a continuing basis--no matter how peace is defined: peace of mind, civil peace, cooperation, justice, peaceful living, a world without war...? How can the seeds of peace be planted and guaranteed to grow? How can we go beyond the rhetoric of peace to its reality--without richocheting from war to peace to war again? Since in modern times society is constantly changing, can we direct change to steer it towards peace?**
Peacenik

Dear Peacenik: All of us desire peace. But throughout history, we have learned to live peacefully only periodically.

If we were to ask this question of everyone: "What are the strategies, tactics, technologies, methods, techniques, philosophies, and processes for peace?"--few of us could quickly come up with answers.

Two relatively new sciences, the anticipatory sciences (about 15 years old) and the general systems sciences (a little over 25 years old), offer some new clues, approaches, philosophies, theories, methods, techniques, and processes that could help to achieve peace. In applying their new paradigms, it becomes obvious that the basic societal structures have not yet been built for peace. To achieve future peace, the conclusion that one quickly comes to from studies using these new sciences is that, at the very least, we must:

1. Add the study of peace in all levels of education (K through 12 and each college year) as a mandatory set of courses and integrate the subject matter into all others in order that each of us will have the knowledge and intuitions for achieving and maintaining peace. Peace education must become a basic part of one's education - as basic as math.

2. Establish a Department of Peace in each country with a goal to maximize international cooperation. Establish peace bureaucracies. "Peace Departments" at the state and national government levels are required. That is, we need a huge peace bureaucracy whose plodding progress would be nearly impossible to turn off or to turn away from the goal of peace. Its purpose would be to create the societal infrastructure for implementing peace strategies, tactics, plans, governing, management, controls, politicalization, research, and instruments of peace, and more.

3. Institutionalize a peace-industrial complex stronger than a military industrial complex. That is, create the incentive for an industrial sector for researching, creating, entrepreneuring, planning, designing, developing, managing, and manufacturing peace technology, products, machinery, software and services. Institute a system for creating jobs and a means for making huge profits from peace. If individuals and corporations could make a buck on peace, they would have an overwhelming economic incentive for peace.

4. Establish a standard peace index, a standard measurement of a nation's and the world's "quality of peace" trend -- a "peace pulse" or "peace temperature" equivalent to the GNP for measuring the state of the economy.

5. Study what peace means -- for individuals, institutions, businesses, states, and nations -- in order to define peace beyond the absence of war, to learn how to live peacefully with one's self, one's family, and others, to learn the key methodologies of peace -- cooperation, justice, helping, loving, caring, etc.

6. Build machinery/technology for peace -- including war prevention systems, tools for assisting cooperation,

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computers for the real-time access of knowledge to help us maintain peaceful daily interactions with others, ...

7. Conduct R&D for peace and establish a "Peace Science."

8. And more.

As can be seen, we need pre- and pro-active (preventive) systems -- strategic government, policies, institutions, etc. -- which are futures oriented, to achieve peace, rather than casting them as reactive tactical systems.

These recommendations are the minimal starting point. Once initiated, they would help to structure a societal change, causing society to move toward peace. Of course, the impact and consequences (peace!) would take many years to achieve. Therefore, and in the meantime, society must also continue to implement short-term defensive and reactive solutions before reaping the benefits of creating future opportunities for peace.

That is, peace is not something that will happen by itself. In order to make peace happen, it must be part of the world's systems of thinking in families, individuals, government, science, technology, industry, business, values, education, intuition, etc. So far all nations have spent far too little of their resources for peace.

In a democracy, we must debate how peace is to be achieved, elect people interested in peace, create peace jobs, etc. to lead us into peace. We need to hire people whose jobs are to generate and maintain peace and to build peace machines and systems. We need to hire teachers to teach us about peace. But to do so, we need government offices and departments of peace, projects for peace, machinery in place for peace, peace services for helping people achieve peace, and peace courses, curriculum, and schools so people can learn about peace. No nation has instituted any of these requirements for peace, as yet; therefore, we continue to live in a world which is far from being peaceful.

A growing number of scientists have studied war and are coming to the conclusion that the only alternative is peace -- there are no longer methods for defense, nor for winning at war. The only alternative is "not to enter the game of war." That is, the only alternative is to learn to live peacefully.

Change allows opportunities to surface and grow -- change allows systems to be re-designed, eliminating their inherent problems and adding new and opportunistic desirable aspects. Without system change, the prevailing tendencies of the past will continue. Since in the recent past we have been experiencing constant war somewhere in the world, obviously, from a peace viewpoint, we don't want the past to continue. Change may be aimed in one direction or another. It can be directed towards peace only if we include such a direction of change in our plans. It is a time for all individuals, families, institutions, and nations to put into their planning their plans for peace.

Recognizing gaps and deficiencies is a first step toward fulfilling the peace needs of the future. Because, we can't stop just at the recognition stage, we must take active steps to reach the desirable goal of peace forever.

Earl C. Joseph, President/Futurist
Anticipatory Sciences Incorporated

ASK A FUTURIST. Robots.

Dear Futurist: **I heard that machines could be made more intelligent than humans! Is this possible? What happens to people when scientists can make such smart robots?** Not a Robot.

Dear Not a Robot: Before answering your questions, it's important to understand what is meant by machine intelligence or "artificial intelligence" (AI).

Practically speaking, artificial intelligence consists of imitating human intelligence in machines--but not in the same way that humans are intelligent. Recent breakthroughs in AI now allow its practical design and application in the area of "expert" or knowledge-based systems. These are computer programs designed to represent and apply the factual knowledge of specific and limited areas of expertise.

Knowledge in expert systems consists of information, facts, logic, rules, opinions, beliefs and "heuristics." Heuristics includes processes that the mind uses to discover something. Heuristics includes such notions as inductive and deductive reasoning processes, methods of invention, problem solving, empirical reasoning, rules of thumb, creating, thinking, learning, and the like.

Further, expert systems emphasize domain-specific problem-solving strategies employing "self-knowledge." They contain knowledge to reason with in their programmed inference reasoning processes. They also provide explanations and justifications for the conclusions they reach. So far, expert systems solve problems that generally fall into such categories as planning, decision making, design, interpretation, extrapolation, prediction, diagnosis, control, monitoring, management, repair, instruction, recognition, assessment, and debugging. They perform difficult tasks at a level that imitates expert human performance.

Practical knowledge-based expert systems are applied either in a machine (like a robot or a machine tool) or as an amplifier for a human, as a tool to extend the capabilities of human knowledge or reasoning.

Between 100 and 200 expert systems are either in the design stage or in use. All have very narrowly directed, domain-specific AI. That is, their contained knowledge bases cover only a very narrow area of "intelligence."

At Stanford University an expert system called DENDRAL analyzes chemical experiment data to infer plausible structures (and the chemicals) of unknown compounds. DENDRAL proceeds in the manner of a detective to solve the mystery as to what chemicals are contained in a chemical mixture. This AI system is used daily by chemists worldwide. DENDRAL has reached a level of expertise, after 17 years of research, that surpasses all human expert chemists in performing its limited tasks. As a consequence, DENDRAL is causing chemists to redefine the roles of humans versus machines in chemical research.

Another computer program, MACSYMA, developed at Massachusetts Institute of Technology, performs symbolic mathematics in the area of differential and integral calculus. Like DENDRAL, it excels by surpassing most human mathematicians in the narrow set of tasks which it is capable of performing.

From these examples of two expert systems and a number of others that could be cited, I declare the answer to your question to be yes. It is possible for machines to have access to more knowledge than humans--and to apply such knowledge for practical purposes. Expert systems are, however, not robots--they are consulting tools or appliances used for amplifying human skills. Nevertheless, in this consultative role, these machines can be designed to surpass human capabilities.

AI processes can also be integrated into robot-type machines to make robots "intelligent." As we move farther into such a future, there is no doubt that there will be more and more expert amplifiers and intelligent robots applied in a growing number of arenas.

Such "intelligent" systems will be used to displace certain human roles in some professional and non-professional work situations as they become more "intelligent" than humans. As stated earlier, this is already occurring in the chemical field because of DENDRAL.

However, one word in our lexicon suggests a different future, something other than the displacement of humans by intelligent machines. That word is synergy. Synergy refers to the cooperative action of separate systems which, when working together, have a greater total effect than the sum of tneir individual effects. The two separate systems described here are an expert system and the human mind. When expert systems are used to amplify a human at work (as a consultative tool) synergy becomes operative. The human has access to personal knowledge and intelligence, the knowledge and intelligence in an expert system plus a synergistic factor, making the total knowledge and intelligence greater than the sum of the two parts. Thus, no matter how "intelligent" the machines become, when we use them as amplifiers for ourselves, humans will always be more capable than the machine itself--even when the machine by itself is more "intelligent" than the human! We can be assured that society will need humans--and that humans will always have a role. But even so, "intelligent machines" will displace an increasing number of people from a growing list of jobs. But since these intelligent machines will permit humans to be more intelligent, new jobs will be created--many more than are displaced--for doing that which has been heretofore impossible, either because we didn't know how or because we didn't have the intelligence.

Such "intelligent" machines will (and are) de-skilling the professions. The use of forerunner "dumb machines" primarily displaced non-professional jobs by performing tasks more efficiently than humans--causing such jobs to be de-skilled. Now with "intelligent machines", professional jobs will be de-skilled, allowing non-professionals amplified by expert consulting machines to perform at a professional level.

Robots and automated machines, intelligent or not (but more so if intelligent), directly displace people from jobs. They are designed specifically to do so. Expert systems are designed to assist humans. Since expert systems amplify humans by providing a consultative facility, they don't displace the human they are assisting. But by raising the productivity of the person they are amplifying, they indirectly create a surplus of workers to do a set amount of work. Further, nevertheless, because people become more capable through the use of expert systems, new jobs are created by allowing society to raise the quality of life, the standard of living and the level of civilization--activities that would be impossible without the amplification of expert systems.

Thus, the role of future humans, in an era of intelligent machines and robots, will continue to do some things beyond and/or better than machines.

Earl C. Joseph, Futurist/President
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